

University of Groningen

The psychophysiology of selective attention and working memory in children with PPDNOS and/or ADHD

Gomarus, Henriette Karin

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:
2010

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Gomarus, H. K. (2010). *The psychophysiology of selective attention and working memory in children with PPDNOS and/or ADHD*. [Thesis fully internal (DIV), Rijksuniversiteit Groningen, Faculty of Medical Sciences]. s.n.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

References

- Aasman J, Wijers AA, Mulder G, Mulder LJM. Measuring mental fatigue in normal daily working routines. In: Hancock PA, Meshkati N, editors. *Human Mental Workload*. Amsterdam: North-Holland, 1988: 117-138.
- Achenbach TM, Edelbrock CS. *Manual for the Child Behavior Checklist and revised profile*. Burlington, Vermont: University of Vermont, Department of Psychiatry, 1983.
- Akselrod S, Gordon D, Madwed JB, Snidman NC, Shannon DC, Cohen RJ. Hemodynamic regulation: investigation by spectral analysis. *Am J Physiol* 1985; 249(4 Pt 2):H867-H875.
- Allen RJ, Baddeley AD, Hitch GJ. The binding of visual features in working memory: Is integration automatic or resource demanding? *J Exp Psychol* 2006; 135:298-313.
- Althaus M, De Sonnevile LMJ, Minderaa RB, Hensen LGN, Til RB. Information Processing and Aspects of Visual Attention in Children with the DSM-III-R Diagnosis "Pervasive Developmental Disorder Not Otherwise Specified" (PDD-NOS): I. Focused and Divided Attention. *Child Neuropsychol* 1996a; 2(1):17-29.
- Althaus M, De Sonnevile LMJ, Minderaa RB, Hensen LGN, Til RB. Information Processing and Aspects of Visual Attention in Children with the DSM-III-R Diagnosis "Pervasive Developmental Disorder Not Otherwise Specified" (PDD-NOS): II. Sustained Attention. *Child Neuropsychol* 1996b; 2(1):30-38.
- Althaus M, Mulder LJM, Mulder G, Aarnoudse CC, Minderaa RB. Cardiac adaptivity to attention-demanding tasks in children with a pervasive developmental disorder not otherwise specified (PDD-NOS). *Biol Psychiatry* 1999; 46(6):799-809.
- Althaus M, Mulder LJM, Mulder G, Van Roon AM, Minderaa RB. Influence of respiratory activity on the cardiac response pattern to mental effort. *Psychophysiology* 1998; 35(4):420-430.
- American Electroencephalographic Society. Guideline thirteen: Guidelines for standard electrode position nomenclature. *J Clin Neurophysiol* 1994; 11:111-113.
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition Text Revision (DSM-IV-TR™)*. Washington DC: 2000.
- Arnolds DEAT, Lopes da Silva FH, Aitink JW, Kamp A, Boeijinga P. The spectral properties of hippocampal EEG related to behaviour in man. *Electroencephalogr Clin Neurophysiol* 1980; 50:324-328.
- Aston-Jones G, Rajkowski J, Cohen J. Role of locus coeruleus in attention and behavioral flexibility. *Biol Psychiatry* 1999; 46(9):1309-1320.
- Awh E, Jonides J, Smith EE, Schumacher EH, Koeppe RA, Katz S. Dissociation of storage and rehearsal in verbal working memory: Evidence from positron emission tomography. *Psychol Sci* 1996; 7(1):25-31.
- Baddeley A. *Working Memory*. Oxford, England: Oxford University Press, 1986.
- Baddeley A. The fractionation of working memory. *Proc Natl Acad Sci USA* 1996; 93(24):13468-13472.
- Baddeley A. The episodic buffer: a new component of working memory? *Trends Cogn Sci* 2000; 4(11):417-423.
- Baddeley A, Hitch GJ. *Working Memory*. In: Bower GH, editor. *The psychology of learning and motivation*. New York: Academic Press, 1974: 47-89.
- Banaschewski T, Brandeis D. Annotation: What electrical brain activity tells us about brain function that other techniques cannot tell us - a child psychiatric perspective. *J Child Psychol Psychiatr* 2007; 48(5):425-435.
- Barkley RA, Grodzinsky G, DuPaul GJ. Frontal lobe functions in attention deficit disorder with and without hyperactivity: a review and research report. *J Abnorm Child Psychol* 1992; 20(2):163-188.

- Barkley RA. Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin* 1997; Bulletin.
- Barry RJ, Johnstone SJ, Clarke AR. A review of electrophysiology in attention-deficit/hyperactivity disorder: II. Event-related potentials. *Clin Neurophysiol* 2003; 114(2):184-198.
- Basar E, Basar-Eroglu C, Karakas S, Schürmann M. Oscillatory brain theory: a new trend in neuroscience. *IEEE Eng Med Biol Mag* 1999; 18:56-66.
- Bastiaansen MCM. Anticipatory attention: an event-related desynchronization approach. *Int J Psychophysiol* 2001; 43(1):91-107.
- Bastiaansen MCM, Hagoort P. Event-induced theta responses as a window on the dynamics of memory. *Cortex* 2003; 39(4-5):967-992.
- Bastiaansen MCM, van Berkum JJA, Hagoort P. Event-related theta power increases in the human EEG during online sentence processing. *Neurosci Lett* 2002; 323(1):13-16.
- Belmonte MK, Yurgelun-Todd DA. Functional anatomy of impaired selective attention and compensatory processing in autism. *Brain Res Cogn Brain Res* 2003; 17(3):651-664.
- Bennetto L, Pennington BF, Rogers SJ. Intact and impaired memory functions in autism. *Child Dev* 1996; 67(4):1816-1835.
- Berridge CW, Waterhouse BD. The locus coeruleus-noradrenergic system: modulation of behavioral state and state-dependent cognitive processes. *Brain Res Brain Res Rev* 2003; 42:33-84.
- Blöte AW, Curfs LMG. Het gebruik van de Conners Teacher Rating Scale in Nederland. *Nederlands Tijdschrift voor de Psychologie* 1986; 41:226-236.
- Boiten F, Sergeant J, Geuze R. Event-related desynchronization: the effects of energetic and computational demands. *Electroencephalogr Clin Neurophysiol* 1992; 82(4):302-309.
- Booth JR, Burman DD, Meyer JR, Zhang L, Trommer BL, Davenport ND et al. Larger deficits in brain networks for response inhibition than for visual selective attention in attention deficit hyperactivity disorder (ADHD). *J Child Psychol Psychiatry and Allied Disciplines* 2005; 46(1):94-111.
- Broadbent DR. *Decision and Stress*. London: Academic Press, 1971.
- Brodeur A, Pond M. The development of selective attention in children with attention deficit hyperactivity disorder. *J Abnorm Child Psychol* 2001; 29(3):229.
- Burack JA. Selective attention deficits in persons with autism: preliminary evidence of an inefficient attentional lens. *J Abnorm Psychol* 1994; 103:535-543.
- Burgess AP, Gruzeliér JH. Short duration power changes in the EEG during recognition memory for words and faces. *Psychophysiology* 2000; 37:596-606.
- Carter CS, Krenér P, Chaderjian M, Northcutt C, Wolfe V. Abnormal processing of irrelevant information in attention deficit hyperactivity disorder. *Psychiatry Research* 1995; 56(1):59-70.
- Castellanos FX, Sonuga-Barke EJS, Scheres A, Di Martino A, Hyde C, Walters JR. Varieties of attention-deficit/hyperactivity disorder-related intraindividual variability. *Biol Psychiatry* 2005; 57:1416-1423.
- Castellanos FX, Tannock R. Neuroscience of attention-deficit/hyperactivity disorder: The search for endophenotypes. *Nat Rev Neurosci* 2002; 3:617-628.
- Ceci S.J., Tishman J. Hyperactivity and incidental memory: Evidence for attentional diffusion. *Child Dev* 1984; 55:2193-2203.
- Ciesielski KT, Courchesne E, Elmasian R. Effects of focused selective attention tasks on event-related potentials in autistic and normal individuals. *Electroencephalogr Clin Neurophysiol* 1990; 75(3):207-220.
- Ciesielski KT, Knight JE, Prince RJ, Harris RJ, Handmaker SD. Event-related potentials in cross-modal divided attention in autism. *Neuropsychologia* 1995; 33(2):225-246.
- Clark T, Feehan C, Tinline C, Vostanis P. Autistic symptoms in children with attention deficit-hyperactivity disorder. *Eur Child Adolesc Psychiatry* 1999; 8(1):50-55.
- Clarke AR, Barry RJ, McCarthy R, Selikowitz M. Age and sex effects in the EEG: development of the normal child. *Clin Neurophysiol* 2001; 112(5):806-814.
- Conners CK. A teacher rating scale for use in drug studies with children. *Am J Psychiatry* 1967; 126:152-156.

-
- Conners CK. Rating scales for use in drug studies with children. *Psychopharmacology Bulletin* 1973; 9(Special Issue, Pharmacology in children):24-84.
- Corbett B, Constantine LJ, Hendren R, Rocke D, Ozonoff S. Examining executive functioning in children with autism spectrum disorder, attention deficit hyperactivity disorder and typical development. *Psychiatry Research* 2009; 166:210-222.
- Courchesne E. Neurophysiological correlates of cognitive development - changes in long-latency event-related potentials from childhood to adulthood. *Electroencephalogr Clin Neurophysiol* 1978; 45(4):468-482.
- Courchesne E, Lincoln AJ, Kilman BA, Galambos R. Event-related brain potential correlates of the processing of novel visual and auditory information in autism. *J Autism Dev Disord* 1985; 15(1):55-76.
- Courchesne E, Lincoln AJ, Yeung-Courchesne R, Elmasian R, Grillon C. Pathophysiologic findings in nonretarded autism and receptive developmental language disorder. *J Autism Dev Disord* 1989; 19(1):1-17.
- De Bruyn EEJ, Ferdinand RF, Meester S, de Nijs PFA, Verheij F. High rates of psychiatric comorbidity in PDD-NOS. *J Autism Dev Disord* 2007; 37:877-886.
- Diamond A. Attention-deficit disorder (attention-deficit/hyperactivity disorder without hyperactivity): A neurobiologic ally and behaviorally distinct disorder from attention-deficit/hyperactivity disorder (with hyperactivity). *Development and Psychopathology* 2005; 17(3):807-825.
- Donchin E, Karis D, Bashor TR, Coles MGH, Gratton G. Cognitive psychophysiology and human information processing. In: Coles MGH, Donchin E, Porges SW, editors. *Psychophysiology: Systems, processes, and applications*. New York: Guilford Press, 1986: 702-778.
- Doppelmayr M, Klimesch W, Hodlmoser K, Sauseng P, Gruber W. Intelligence related upper alpha desynchronization in a semantic memory task. *Brain Research Bulletin* 2005; 66(2):171-177.
- Dujardin K, Derambure P, Defebvre L, Bourriez JL, Jacquesson JM, Guieu JD. Evaluation of event-related desynchronization (ERD) during a recognition task: effect of attention. *Electroencephalogr Clin Neurophysiol* 1993; 86(5):353-356.
- Durston S, Fosella JA, Casey BJ, Hulshoff Pol HA, Galvan A, Schnack HG et al. Differential effects of DRD4 and DAT1 genotype on fronto-striatal gray matter volumes in a sample of subjects with attention deficit hyperactivity disorder, their unaffected siblings, and controls. *Molecular Psychiatry* 2005; 10:678-685.
- Eysenck HJ. The biological basis of personality. Springfield, IL: Thomas, 1967.
- Eysenck HJ. General features of the model. In: Eysenck HJ, editor. *A model for personality*. New York: Springer-Verlag, 1981: 1-37.
- Eysenck MW. Endogenous Determinants of Arousal. *Attention and Arousal: Cognition and Performance*. Berlin: Springer-Verlag Berlin Heidelberg, 1982.
- Feige B, Scheffler K, Esposito F, Di Salle F, Hennig J, Seifritz E. Cortical and Subcortical Correlates of Electroencephalographic Alpha Rhythm Modulation. *J Neurophysiol* 2005; 93(5):2864-2872.
- Fombonne E. Epidemiology of autistic disorder and other pervasive developmental disorders. *Journal of Clinical Psychiatry* 2005; 66:3-8.
- Foote SL, Berridge CW, Adams LM, Pineda JA. Electrophysiological evidence for the involvement of the locus coeruleus in alerting, orienting, and attending. *Prog Brain Res* 1991; 88:521-532.
- Frazier JA, Biederman J, Bellordre CA, Garfield SB, Geller DA, Coffey BJ et al. Should the diagnosis of Attention-Deficit/Hyperactivity disorder be considered in children with Pervasive Developmental Disorder? *J of Attention Disorders* 2001; 4(4):203-211.
- Gasser T. Development of the EEG of school-age children and adolescents. II. Topography. *Electroencephalogr Clin Neurophysiol* 1988; 69(2):100-109.
- Geurts HM, Corbett B, Solomon M. The paradox of cognitive flexibility in autism. *Trends Cogn Sci* 2009; 13(2):74-82.
- Geurts HM, Grasman RPPP, Verté S, Oosterlaan J, Roeyers H, Van Kammen SM et al. Intra-individual variability in ADHD, autism spectrum disorders and Tourette's syndrome. *Neuropsychologia* 2008; 46:3030-3041.
- Geurts HM, Verté S, Oosterlaan J, Roeyers H, Sergeant JA. How specific are executive functioning deficits in attention deficit hyperactivity disorder and autism? *J Child Psychol Psychiatry* 2004; 45(4):836-854.

- Gevins A, Smith ME. Neurophysiological measures of working memory and individual differences in cognitive ability and cognitive style. *Cereb Cortex* 2000; 10(9):829-839.
- Gevins A, Smith ME, McEvoy L, Yu D. High-resolution EEG mapping of cortical activation related to working memory: effects of task difficulty, type of processing, and practice. *Cereb Cortex* 1997; 7(4):374-385.
- Gevins A, Smith ME, Le J, Leong H, Bennett J, Martin N et al. High resolution evoked potential imaging of the cortical dynamics of human working memory. *Electroencephalogr Clin Neurophysiol* 1996; 98(4):327-348.
- Goldberg MC, Mostofsky SH, Cutting LE, Mahone EM, Astor BC, Denckla MB et al. Subtle executive impairment in children with autism and children with ADHD. *J Autism Dev Disord* 2005; 35(3):279-293.
- Goldstein G, Johnson CR, Minshew NJ. Attentional processes in autism. *J Autism Dev Disord* 2001; 31(4):433-440.
- Goldstein S, Schwabach AJ. The comorbidity of pervasive developmental disorder and attention deficit hyperactivity disorder: Results of a retrospective chart review. *J Autism Dev Disord* 2004; 34(3):329-339.
- Gomarus HK, Althaus M, Wijers AA, Minderaa RB. The effects of memory load and stimulus relevance on the EEG during a visual selective memory search task - an ERP and ERD/ERS study. *Clin Neurophysiol* 2006; 117(4):871-884.
- Gomarus HK, Wijers AA, Minderaa R, Althaus M. ERP correlates of selective attention and working memory capacities in children with ADHD and/or PDD-NOS. *Clin Neurophysiol* 2009a; 120(1):60-72.
- Gomarus HK, Wijers AA, Minderaa R, Althaus M. Do children with ADHD and/or PDD-NOS differ in reactivity of alpha/theta ERD/ERS to manipulations of cognitive load and stimulus relevance? *Clin Neurophysiol* 2009b; 120(1):73-79.
- Gratton G, Coles MG, Donchin E. A new method for off-line removal of ocular artifacts. *Electroencephalogr Clin Neurophysiol* 1983; 55:468-484.
- Green DM, Swets JA. Signal detection theory and psychophysics. New York: Wiley, 1966.
- Grossman P. Respiratory and cardiac rhythms as windows to central and autonomic biobehavioral regulation: selection of window frames, keeping the panes clean and viewing the neural topography. *Biol Psychol* 1992; 34(2-3):131-161.
- Grune K, Metz AM, Hagendorf H, Fischer S. Information processing in working memory and event-related brain potentials. *Int J Psychophysiol* 1996; 23(1-2):111-120.
- Halgren E, Babb TL, Crandall PH. Human hippocampal CA1 neurons during a cholinergically induced rhythmic state. *Electroencephalogr Clin Neurophysiol* 1978; 44:778-781.
- Happé F, Booth R, Charlton R, Hughes C. Executive function deficits in autism spectrum disorders and attention-deficit/hyperactivity disorder: Examining profiles across domains and ages. *Brain and Cognition* 2006; 61(1):25-39.
- Harter MR, Aine CJ. Brain mechanisms of visual selective attention. In: Parasuraman R, Davies DR, editors. *Varieties of Attention*. New York: Academic Press, 1984: 293-321.
- Hartman CA, Luteijn E, Serra M, Minderaa R. Refinement of the children's social behavior questionnaire (CSBQ): An instrument that describes the diverse problems seen in milder forms of PDD. *J Autism Dev Disord* 2006; 36(3):325-342.
- Hazell PL, Carr VJ, Lewin TJ, Dewis SAM, Heathcote DM, Brucki BM. Effortful and automatic information processing in boys with ADHD and specific learning disorders. *J Child Psychol Psychiatry and Allied Disciplines* 1999; 40(2):275-286.
- Heinrich H, Moll GH, Dickhaus H, Kolev VN, Yordanova J, Rothenberger A. Time-on-task analysis using wavelet networks in an event-related potential study on attention-deficit hyperactivity disorder. *Clin Neurophysiol* 2001; Vol 112(7):1280-1287.
- Hillyard SA, Anllo-Vento L. Event-related brain potentials in the study of visual selective attention. *Proc Natl Acad Sci USA* 1998; 781-787.
- Hillyard SA, Picton TW. Event-related brain potentials and selective information processing in man. *Progress in clinical neurophysiology: Vol. 6. Cognitive components in cerebral event-related potentials and selective attention*. Basel, Switzerland: Karger, 1979: 1-52.
- Hochhaus L. A table for the calculation of d' and beta. *Psychological Bulletin* 1972; 5:375-376.

-
- Hoeksma MR, Kemner C, Verbaten M, Van Engeland H. Processing capacity in children and adolescents with pervasive developmental disorders. *J Autism Dev Disord* 2004; 34(3):341-354.
- Huang-Pollock CL, Nigg JT, Carr TH. Deficient attention is hard to find: applying the perceptual load model of selective attention to attention deficit hyperactivity disorder subtypes. *J Child Psychol Psychiatry and Allied Disciplines* 2005; 46(11):1211-1218.
- Hughes C, Russell J, Robbins TW. Evidence for executive dysfunction in autism. *Neuropsychologia* 1994; 32(4):477-492.
- Jarrold C, Towse JN. Individual differences in working memory. *Neuroscience* 2006; 139:39-50.
- Jasper H. Report on the committee on methods of clinical examination in electroencephalography. *Electroencephalogr Clin Neurophysiol* 1958; 10:370-375.
- Jensen VK, Larrieu JA, Mack KK. Differential diagnosis between attention-deficit/hyperactivity disorder and pervasive developmental disorder-not otherwise specified. *Clin Pediatr (Phila)* 1997; 36(10):555-561.
- Jonkman LM, Kemner C, Verbaten MN, Van Engeland H, Camfferman G, Buitelaar JK et al. Attentional capacity, a probe ERP study: differences between children with attention-deficit hyperactivity disorder and normal control children and effects of methylphenidate. *Psychophysiology* 2000; 37(3):334-346.
- Jonkman LM, Kenemans JL, Kemner C, Verbaten MN, Van Engeland H. Dipole source localization of event-related brain activity indicative of an early visual selective attention deficit in ADHD children. *Clin Neurophysiol* 2004; 115(7):1537-1549.
- Jonkman LM, Kemner C, Verbaten MN, Koelega HS, Camfferman G, Van der Gaag RJ et al. Effects of methylphenidate on event-related potentials and performance of attention-deficit hyperactivity disorder children in auditory and visual selective attention tasks. *Biol Psychiatry* 1997a; Vol 41(6):690-702.
- Jonkman LM, Kemner C, Verbaten MN, Koelega HS, et al. Event-related potentials and performance of attention-deficit hyperactivity disorder: Children and normal controls in auditory and visual selective attention tasks. *Biol Psychiatry* 1997b; Vol 41(5):595-611.
- Jorna PGAM. Spectral analysis of heart rate and psychological state: A review of its validity as a workload index. *Biol Psychiatry* 1992; 34:237-257.
- Kalverboer AF. Behavioral observation inventory for children in the school and in the family. 1973. Groningen, Experimental Clinical Psychology, University of Groningen.
- Kalverboer AF. Hyperactivity an Observational Studies. In: Bloomingdale LM, Sergeant JA, editors. *Attention Deficit Hyperactivity Disorder: Criteria, Cognition, Intervention*. London: Pergamon Press, 1988: 29-42.
- Kalverboer AF. Developmental Biopsychology: Experimental and Observational Studies in Children at Risk. Ann Arbor: The University of Michigan Press, 1990.
- Kane MJ, Engle RW. The role of prefrontal cortex in working-memory capacity, executive attention, and general fluid intelligence: An individual-differences perspective. *Psychonomic bulletin & review* 2002; 9(4):637-671.
- Karatekin C, Asarnow RF. Components of visual search in childhood-onset schizophrenia and attention-deficit/hyperactivity disorder. *J Abnorm Child Psychol* 1998; 26(5):367-380.
- Karatekin C. A test of the integrity of the components of Baddeley's model of working memory in attention-deficit/hyperactivity disorder (ADHD). *J Child Psychol Psychiat* 2004; 45(5):912-926.
- Kasai K, Okazawa K, Nakagome K, Hiramatsu K, Hata A, Fukuda M et al. Mismatch negativity and N2b attenuation as an indication for dysfunction of the preattentive and controlled processing for deviance detection in schizophrenia: A topographic event-related potential study. *Schizophrenia Research* 1999; 35:141-156.
- Kemner C, Verbaten MN, Cuperus JM, Camfferman G, Van Engeland H. Visual and somatosensory event-related brain potentials in autistic children and three different control groups. *Electroencephalogr Clin Neurophysiol* 1994; 92(3):225-237.
- Kemner C, Van der Gaag RJ, Verbaten M, van Engeland H. ERP differences among subtypes of pervasive developmental disorders. *Biol Psychiatry* 1999; 46(6):781-789.
- Kiss I, Pisis C, Francois A, Schopf-Dochow D. Central executive function in working memory: event-related brain potential studies. *Brain Res Cogn Brain Res* 1998; 6(4):235-247.

- Kitney RI. An analysis of the nonlinear behaviour of the human thermal vasomotor control system. *J Theor Biol* 1975; 52(1):231-248.
- Klimesch W. Theta synchronization and alpha desynchronization in a memory task. *Psychophysiology* 1997; 34(2):169-176.
- Klimesch W. EEG alpha and theta oscillations reflect cognitive and memory performance: a review and analysis. *Brain Res Brain Res Rev* 1999; 29(2-3):169-195.
- Klimesch W, Doppelmayr M, Schwaiger J, Auinger P, Winkler T. 'Paradoxical' alpha synchronization in a memory task. *Brain Res Cogn Brain Res* 1999; 7(4):493-501.
- Klimesch W, Doppelmayr M, Stadler W, Pollhuber D, Sauseng P, Rohm D. Episodic retrieval is reflected by a process specific increase in human electroencephalographic theta activity. *Neurosci Lett* 2001; 302(1):49-52.
- Klimkeit EI, Mattingley JB, Sheppard DM, Lee P, Bradshaw JL. Motor preparation, motor execution, attention, and executive functions in attention deficit/hyperactivity disorder (ADHD). *Child Neuropsychol* 2005; 11(2):153-173.
- Kok A. On the utility of P3 amplitude as a measure of processing capacity. *Psychophysiology* 2001; 38(3):557-577.
- Koshino H, Carpenter PA, Minshew NJ, Cherkassky VL, Keller TA, Just MA. Functional connectivity in an fMRI working memory task in high-functioning autism. *NeuroImage* 2005; 24(3):810-821.
- Krause C, Åström T, Karrasch M, Laine M, Sillanmäki L. Cortical activation related to auditory semantic matching of concrete versus abstract words. *Clin Neurophysiol* 1999; 110:1371-1377.
- Krause CM, Salminen PA, Sillanmäki L, Holopainen IE. Event-related desynchronization and synchronization during a memory task in children. *Clin Neurophysiol* 2001; 112(12):2233-2240.
- Krause CM, Heikki Lang A, Laine M, Kuusisto M, Pörn B. Event-related. EEG desynchronization and synchronization during an auditory memory task. *Electroencephalogr Clin Neurophysiol* 1996; 98(4):319-326.
- Krause CM, Sillanmäki L, Koivisto M, Saarela C, Häggqvist A, Laine M et al. The effects of memory load on event-related EEG desynchronization and synchronization. *Clin Neurophysiol* 2000; 111(11):2071-2078.
- Lahey BB, Schaughency EA, Hynd GW, Carlson CL, Nieves N. Attention-Deficit Disorder with and Without Hyperactivity - Comparison of Behavioral-Characteristics of Clinic-Referred Children. *J Am Acad Child Adolesc Psychiatry* 1987; 26(5):718-723.
- Lange JJ, Wijers AA, Mulder LJM, Mulder G. Color selection and location selection in ERP's: differences, similarities and 'neural specificity'. *Biol Psychol* 1998; 48:153-182.
- Levy R, Goldman-Rakic PS. Association of storage and processing functions in the dorsolateral prefrontal cortex of the nonhuman primate. *J Neurosci* 1999; 19:5149-5158.
- Lorist MM, Snel J, Mulder G, Kok A. Aging, caffeine, and information processing: An event-related potential analysis. *Electroencephalogr Clin Neurophysiol* 1995; Vol 96(5):453-467.
- Losier BJ, McGrath PJ, Klein RM. Error patterns on the continuous performance test in non-medicated and medicated samples of children with and without ADHD: a meta-analytic review. *J Child Psychol Psychiatry* 1996; 37(8):971-987.
- Lovaas OI, Koegel RL, Schreibman L. Stimulus overselectivity in autism: A review of research. *Psychological Bulletin* 1979; 86:1236-1254.
- Lovaas OI, Schreibman L. Stimulus overselectivity of autistic children in a two stimulus situation. *Behaviour Research and Therapy* 1971; 9:305-310.
- Luteijn E. The children's social behavior questionnaire for milder variants of PDD problems: Evaluation of the psychometric characteristics. *J Autism Dev Disord* 2000; 30(4):317-330.
- Luteijn E, Minderaa RB, Jackson S. Vragenlijst voor de inventarisatie van sociaal gedrag bij kinderen, Handleiding. Lisse, the Netherlands: Swets and Zeitlinger, 2002.
- Marrufo MV, Vaquero E, Cardoso MJ, Gómez CM. Temporal evolution of alpha and beta bands during visual spatial attention. *Brain research Cognitive brain research* 2001; 12(2):315-320.
- Martinussen R, Hayden J, Hogg-Johnson S, Tannock R. A meta-analysis of working memory impairments in children with attention-deficit/hyperactivity disorder. *J Am Acad Child Adolesc Psychiatry* 2005; 44(4):377-384.

-
- Mason DJ, Humphreys GW, Kent LS. Exploring selective attention in ADHD: visual search through space and time. *J Child Psychol Psychiatry and Allied Disciplines* 2003; 44(8):1158-1176.
- McEvoy LK, Pellouchoud E, Smith ME, Gevins A. Neurophysiological signals of working memory in normal aging. *Brain Res Cogn Brain Res* 2001; 11(3):363-376.
- Minshew NJ, Luna B, Sweeney JA. Oculomotor evidence for neocortical systems but not cerebellar dysfunction in autism. *Neurology* 1999; 52(5):917-922.
- Mulder G, Gloerich ABM, Brookhuis KA, Van Dellen HJ, Mulder LJ. Stage analysis of the reaction process using brain-evoked potentials and reaction time. *Psychol Res* 1984; 46:15-32.
- Mulder G, Wijers AA, Smid HG, Mulder LJM. Individual differences in computational mechanisms: A psychophysiological analysis. In: Kanfer R, Ackerman PL, Cudeck R, editors. *The Minnesota Symposium on learning and individual differences: Abilities, motivation, and methodology*. Hillsdale, NJ: Erlbaum, 1989: 391-434.
- Mulder LJM. Measurement and analysis methods of heart rate and respiration for use in applied environments. *Biol Psychol* 1992; 34(2-3):205-236.
- Mulder LJM, Van Roon A, Schweizer DA. CARSPAN. Cardiovascular Data Analys Environment. Manual. Groningen, The Netherlands: IEC Programma, 1995a.
- Mulder LJM, Veldman JBP, Elgersma AF, Mulder G, Van Roon A. Respiratory pattern, invested effort, and variability in heart rate and blood pressure during the performance of mental tasks. In: Di Rienzo M, Mancina G, Parati A, Pedotti A, Zanchetti A, editors. *Computer analysis of cardiovascular signals*. Amsterdam: IOS Press, 1995b: 219-233.
- Näätänen R, Gaillard AWK. The orienting reflex and the N2 deflection of the event-related potential (ERP). In: Gaillard AWK, Ritter W, editors. *Tutorials in event-related potential research: endogenous components*. Amsterdam: North-Holland: 1983: 119-141.
- Nigg JT, Blaskey LG, Huang-Pollock CL, Rapapley MD. Neuropsychological executive functions and DSM-IV ADHD subtypes. *J Am Acad Child Adolesc Psychiatry* 2002; 41(1):59-66.
- Nigg JT. Neuropsychologic Theory and Findings in Attention-Deficit/Hyperactivity Disorder: The State of the Field and Salient Challenges for the Coming Decade. *Biol Psychiatry* 2005; 57(11):1424-1435.
- Nolan EE, Gadow KD, Sprafkin J. Teacher reports of DSM-IV ADHD, ODD, and CD symptoms in schoolchildren. *Journal of the American Academy of Child and Adolescent Psychiatry* 2001; 40(2):241-249.
- Norman DA, Shallice T. Attention to action: willed and automatic control of behaviour. In: Schwartz GE, Shapiro D, editors. *Consciousness and self-regulation: advances in research and theory*. New York: Plenum Press, 1986: 1-18.
- Nydén A, Gillberg C, Hjelmquist E, Heiman M. Executive Function/Attention Deficits in Boys with Asperger Syndrome, Attention Disorder and Reading/Writing Disorder. *Autism* 1999; 3(3):213-228.
- Okita T, Wijers AA, Mulder G, Mulder LJM. Memory search and visual spatial attention: An event-related brain potential analysis. *Acta Psychol* 1985; 60:263-292.
- Ozonoff S, Jensen J. Brief report: Specific executive function profiles in three neurodevelopmental disorders. *J Autism Dev Disord* 1999; 29(2):171-177.
- Ozonoff S, Pennington BF, Rogers SJ. Executive function deficits in high-functioning autistic individuals: relationship to theory of mind. *J Child Psychol Psychiatry* 1991; 32(7):1081-1105.
- Ozonoff S, Strayer DL. Further evidence of intact working memory in autism. *J Autism Dev Disord* 2001; 31(3):257-263.
- Pagani M, Rimoldi O, Malliani A. Low-frequency components of cardiovascular variabilities as markers of sympathetic modulation. *Trends Pharmacol Sci* 1992; 13(2):50-54.
- Pascualvaca DM, Fantie BD, Papageorgiou M, Mirsky AF. Attentional Capacities in Children with Autism: Is there a general deficit in shifting focus? *J Autism Dev Disord* 1998; 28(6):467-478.
- Pennington BF, Ozonoff S. Executive Functions and Developmental Psychopathology. *J Child Psychol Psychiatry and Allied Disciplines* 1996; 37(1):51-87.
- Perneger TV. What's wrong with Bonferroni adjustments. *Br Med J* 1998; 316(7139):1236-1238.
- Pesonen M, Bjornberg CH, Hamalainen H, Krause CM. Brain oscillatory 1-30 Hz EEG ERD/ERS responses during the different stages of an auditory memory search task. *Neuroscience letters* 2006; 399(1-2):45-50.

- Petrides M. Frontal lobes and working memory: evidence from investigations of the effects of cortical excisions in nonhuman primates. In: Boller F, Grafman J, editors. *Handbook of neuropsychology*. Amsterdam: Elsevier, 1994: 59-82.
- Pfurtscheller G. Graphical display and statistical evaluation of event-related desynchronization (ERD). *Electroencephalogr Clin Neurophysiol* 1977; 43(5):757-760.
- Pfurtscheller G. Event-related synchronization (ERS): an electrophysiological correlate of cortical areas at rest. *Electroencephalogr Clin Neurophysiol* 1992; 83(1):62-69.
- Pfurtscheller G, Aranibar A. Event-related cortical desynchronization detected by power measurements of scalp EEG. *Electroencephalogr Clin Neurophysiol* 1977; 42(6):817-826.
- Pfurtscheller G, Lopes da Silva FH. Event-related EEG/MEG synchronization and desynchronization: basic principles. *Clin Neurophysiol* 1999; 110(11):1842-1857.
- Pierce K, Glad KS, Schreibman L. Social perception in children with autism: an attentional deficit? *J Autism Dev Disord* 1997; 27(3):265-282.
- Polich J, Kok A. Cognitive and biological determinants of P300: an integrative review. *Biol Psychol* 1995; 41(2):103-146.
- Porges SW, Byrne EA. Research methods for measurement of heart rate and respiration. *Biol Psychol* 1992; 34(2-3):93-130.
- Posner MI. Orienting of attention. *Quarterly Journal of Experimental Psychology* 1980; 32:3-25.
- Posner MI. Interaction of arousal and selection in the posterior attention network. In: Baddeley AD, Weiskrantz A, editors. *Attention: Selection, awareness and control. A tribute to Donald Broadbent*. New York: Oxford University Press, 1993: 390-405.
- Posner MI, Petersen SE. The attention system of the human brain. *Annu Rev Neurosci* 1990; 13:25-42.
- Posner MI, Raichle ME. *Images of Mind*. New York: Scientific American Library, 1994.
- Potts GF, O'Donnel BF, Hirayasu Y, McCarley RW. Disruption of neural systems of visual attention in schizophrenia. *Archives of General Psychiatry* 2002; 59:418-424.
- Pribram KH, McGuinness D. Arousal, activation, and effort in the control of attention. *Psychol Rev* 1975; 82(2):116-149.
- Quintana SM, Maxwell SE. A Monte-Carlo comparison of 7 epsilon-adjustment procedures in repeated-measures designs with small sample sizes. *Journal of educational statistics* 1994; 19(1):57-71.
- Redondo M, Valle-Inclan F. Decrements in heart rate variability during memory search. *Int J Psychophysiol* 1992; 13(1):29-35.
- Reiersen AM, Constantino JN, Grimmer M, Martin NG, Todd RD. Evidence for Shared Genetic Influences on Self-Reported ADHD and Autistic Symptoms in Young Adult Australian Twins. *Twin Research and Human Genetics* 2008; 11(5):579-585.
- Reiersen AM, Constantino JN, Volk HE, Todd RD. Autistic traits in a population-based ADHD twin sample. *J Child Psychol Psychiatry* 2007; 48(5):464-472.
- Repovs G, Baddeley A. The multi-component model of working memory: Explorations in experimental cognitive psychology. *Neuroscience* 2006; 139(1):5-21.
- Ridderinkhof KR, Van der Molen MW. A psychophysiological analysis of developmental differences in the ability to resist interference. *Child development* 1995; 66(4):1040-1056.
- Ridderinkhof KR, Van der Stelt O. Attention and selection in the growing child: Views derived from developmental psychophysiology. *Biol Psychol* 2000; Vol 54(1-3):55-106.
- Ronald A, Happé F, Plomin R. A twin study investigating the genetic and environmental aetiologies of parent, teacher and child ratings of autistic-like traits and their overlap. *Eur Child Adolesc Psychiatry* 2008a; 17(8):473-483.
- Ronald A, Simonoff E, Kuntsi J, Asherson P, Plomin R. Evidence for overlapping genetic influences on autistic and ADHD behaviours in a community twin sample. *J Child Psychol Psychiatr* 2008b; 49(5):535-542.
- Ruchkin DS, Canoune HL, Johnson R, Ritter W. Working memory and preparation elicit different patterns of slow wave event-related brain potentials. *Psychophysiology* 1995; 32(4):399-410.
- Ruchkin DS, Johnson R, Canoune H, Ritter W. Short-term memory storage and retention: An event-related brain potential study. *Electroencephalogr Clin Neurophysiol* 1990; Vol 76(5):419-439.

-
- Ruchkin DS, Johnson R, Grafman J, Canoune H, Ritter W. Distinctions and similarities among working memory processes: An event-related potential study. *Brain Res Cogn Brain Res* 1992; Vol 1(1):53-66.
- Russell J, Jarrold C, Henry L. Working memory in children with autism and with moderate learning difficulties. *J Child Psychol Psychiatry* 1996; 37(6):673-686.
- Sanders AF. Towards a model of stress and human performance. *Acta Psychol* 1983; 53:61-97.
- Santosh PJ, Mijovic A. Social impairment in Hyperkinetic Disorder - Relationship to psychopathology and environmental stressors. *Eur Child Adolesc Psychiatry* 2004; 13(3):141-150.
- Satterfield JH, Schell AM, Nicolas T. Preferential neural processing of attended stimuli in attention-deficit hyperactivity disorder and normal boys. *Psychophysiology* 1994; 31(1):1-10.
- Saul JP. Beat-to-beat variations of heart rate reflect modulation of cardiac autonomic outflow. *News Physiological Review* 1990; 5:32-37.
- Sawaki R, Katayama J. Severity of AD/HD symptoms and efficiency of attentional resource allocation. *Neurosci Lett* 2006; 407:86-90.
- Schaefer ES, Droppleman LF, Kalverboer AF. Development of a Classroom Behaviour Checklist and Factor Analyses of Children's School Behaviour in the United States and the Netherlands. 1965. Paper read for the Society for Research in Child Development, Minneapolis, Society for Research in Child Development.
- Schneider W, Shiffrin RM. Controlled and automatic human information processing: I. Detection, search, and attention. *Psychol Rev* 1977; 84:1-66.
- Scholte EM, Ploeg vdJD. Handleiding ADHD Vragenlijst (AVL). Lisse: Swets & Zeitlinger, 1998.
- Senkowski D, Herrmann CS. Effects of task difficulty on evoked gamma activity and ERP in a visual discrimination task. *Clin Neurophysiol* 2002; 113:1742-1753.
- Sergeant J, Scholten CA. On resource strategy limitations in hyperactivity: cognitive impulsivity reconsidered. *J Child Psychol Psychiatr* 1985; 26:97-109.
- Servan-Schreiber D, Prior M, Cohen JD. A network model of catecholamine effects gain signal to noise ratio and behavior. *Science* 1990; 249:892-895.
- Shallice T, Evans ME. The involvement of the frontal lobes in cognitive estimation. *Cortex* 1978; 14:294-303.
- Shiffrin RM, Schneider W. Controlled and automatic information processing: Perceptual learning, automatic attending, and a general theory. *Psychol Rev* 1977; 84:127-190.
- Sinzig J, Morsch D, Bruning N, Schmidt MH, Lehmkuhl G. Inhibition, flexibility, working memory and planning in autism spectrum disorders with and without comorbid ADHD-symptoms. *Child Adolesc Psychiatry Ment Health* 2008; 2(4).
- Smalley S, Loo SK, Yang M, Cantor DS. Toward localizing genes underlying cerebral asymmetry and mental health. *Am J Med Genet B Neuropsychiatr Genet* 2005; 135b(1):79-84.
- Smid HG, Jakob A, Heinze HJ. An event-related brain potential study of visual selective attention to conjunctions of color and shape. *Psychophysiology* 1999; 36(2):264-279.
- Smith EE, Jonides J. Storage and Executive Processes in the Frontal Lobes. *Science* 1999; 283(5408):1657-1661.
- Spielberger CD. Manual for the State-Trait anxiety for children. Palo Alto: Consulting Psychological Press, 1973.
- Stenberg G, Rosen I, Risberg J. Attention and personality in augmenting/reducing of visual evoked potentials. *Pers Individ Diff* 1990; 11(12):1243-1254.
- Steriade M. Corticothalamic resonance, states of vigilance and mentation. *Neuroscience* 2000; 101(2):243-276.
- Stipacek A, Grabner RH, Neuper C, Fink A, Neubauer AC. Sensitivity of human EEG alpha band desynchronization to different working memory components and increasing levels of memory load. *Neurosci Lett* 2003; 353(3):193-196.
- Sturm H, Fernell E, Gillberg C. Autism spectrum disorders in children with normal intellectual levels: associated impairments and subgroup. *Developmental medicine and child neurology* 2004; 46(7):444-447.

- Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology. Heart rate variability. Standards measurement, physiological interpretation, and clinical use. *Circulation* 1996; 93:1043-1064.
- Taylor MJ, Pang EW. Developmental changes in early cognitive processes. *Electroencephalogr Clin Neurophysiol* 1999; 49:145-153.
- Taylor MJ, Sunohara GA, Khan SC, Malone MA. Parallel and serial attentional processes in ADHD: ERP evidence. *Developmental Neuropsychology* 1997; Vol 13(4):531-539.
- Tesche CD, Karhu J. Theta oscillations index human hippocampal activation during a working memory task. *Proc Natl Acad Sci USA* 2000; 97(2):919-924.
- Townsend J, Westerfield M, Leaver E, Makeig S, Jung TP, Pierce K et al. Event-related brain response abnormalities in autism: evidence for impaired cerebello-frontal spatial attention networks. *Brain Res Cogn Brain Res* 2001; 11(1):127-145.
- Turken AU, Swick D. Response selection in the human anterior cingulate cortex. *Nat Neurosci* 1999; 2(10):920-924.
- Van der Meere JJ, Stemerink N, Gunning B. Effects of presentation rate of stimuli on response inhibition in ADHD children with and without tics. *Perceptual and Motor Skills* 1995; 81:259-262.
- Van der Stelt O, Kok A, Smulders FT, Snel J, Gunning BW. Cerebral event-related potentials associated with selective attention to color: developmental changes from childhood to adulthood. *Psychophysiology* 1998; 35(3):227-239.
- Van der Stelt O, Van der Molen MW, Gunning BW, Kok A. Neuroelectrical signs of selective attention to color in boys with attention-deficit hyperactivity disorder. *Brain Res Cogn Brain Res* 2001; 12(2):245-264.
- Van der Veen FM, Lange JJ, Van der Molen MW, Mulder G, Mulder LJM. Event-related brain potential and heart rate manifestations of visual selective attention. *Psychophysiology* 2000; 37:677-682.
- Van Haasen PP, De Bruyn EEJ, Pijl YL, Poortinga YH, Lutje Spelberg HC, Van der Steene G et al. Wechsler Intelligence Scale for Children-Revised. Dutch ed. Lisse, The Netherlands: Swets & Zeitlinger, 1986.
- Van Roon AM, Mulder LJM, Althaus M, Mulder G. Introducing a baroreflex model for studying cardiovascular effects of mental workload. *Psychophysiology* 2004; 41(6):961-981.
- Verbaten MN, Van Engeland H, Kenemans JK, Slangen JL. Abnormal visual event-related potentials of autistic-children. *J Autism Dev Disord* 1991; 21(4):449-470.
- Verhulst FC, Koot JM, Akkerhuis GW, Veerman JW. *Praktische Handleiding voor de CBCL (Child Behavior Checklist)*. Assen: Van Gorcum, 1990.
- Verté S, Geurts HM, Roeyers H, Oosterlaan J, Sergeant JA. The relationship of working memory, inhibition, and response variability in child psychopathology. *Journal of Neuroscience Methods* 2006; 151(1):5-14.
- Volkmar F, Klin A, Cohen DJ. Pervasive Developmental Disorder Not Otherwise Specified. In: Schopler E, Mesibov GB, editors. *Handbook Of Autism and Pervasive Developmental Disorders*. New York: Plenum Press, 1997: 5-40.
- Wachtel PL. Conceptions of broad and narrow attention. *Psychological Bulletin* 1967; 68:417-419.
- Weber DL, Clark CR, McFarlane AC, Moores KA, Morris P, Egan GF. Abnormal frontal and parietal activity during working memory updating in post-traumatic stress disorder. *Psychiatry Research: Neuroimaging* 2005; 140(1):27-44.
- Webster MJ, Ungerleider LG. Neuroanatomy of Visual Attention. In: Parasuraman R, editor. *The Attentive Brain*. Cambridge MA: The MIT Press, 1998: 19-34.
- Wechsler D. *Wechsler Intelligence Scale for Children Revised*. New York: The Psychological Corporation, 1974.
- Wijers AA. Visual selective attention. An electrophysiological approach. University of Groningen, The Netherlands, 1989.
- Wijers AA, Mulder G, Gunter TC, Smid HGOM. Brain potential analysis of selective attention. In: Neumann OE, Sanders AE, editors. *Handbook of Perception and Action: Vol. 4. Attention*. London: Academic Press, 1996: 333-387.
- Wijers AA, Mulder G, Okita T, Mulder LJ. Event-related potentials during memory search and selective attention to letter size and conjunctions of letter size and color. *Psychophysiology* 1989a; 26(5):529-547.

-
- Wijers AA, Mulder G, Okita T, Mulder LJ, Scheffers MK. Attention to color: An analysis of selection, controlled search, and motor activation, using event-related potentials. *Psychophysiology* 1989b; 26(1):89-109.
- Wijker W. ERP ontogenesis in childhood. University of Amsterdam, 1991.
- Willcutt EG, Doyle AE, Nigg JT, Faraone SV, Pennington BF. Validity of the Executive Function Theory of Attention-Deficit/Hyperactivity Disorder: A Meta-Analytic Review. *Biol Psychiatry* 2005; 57(11):1336-1346.
- Williams DL, Goldstein G, Minshew NJ. The Profile of Memory Function in Children With Autism. *Neuropsychology* 2006; 20(1):21-29.
- Wolraich ML, Hannah JN, Baumgaertel A, Feurer ID. Examination of DSM-IV criteria for attention deficit/hyperactivity disorder in a county-wide sample. *Journal of Developmental and Behavioral Pediatrics* 1998; 19(3):162-168.
- Yordanova J, Banaschewski T, Kolev VN, Rothenberger A. Abnormal early stages of task stimulus processing in children with attention-deficit hyperactivity disorder--evidence from event-related gamma oscillations. *Clin Neurophysiol* 2001; 112(6):1096-1108.
- Yordanova J, Kolev VN. Developmental changes in the event-related EEG theta response and P300. *Electroencephalogr Clin Neurophysiol* 1997; 104(5):418-430.
- Yordanova JY, Kolev VN. Developmental changes in the alpha response system. *Electroencephalogr Clin Neurophysiol* 1996; 99(6):527-538.

